



RELIABILITY REPORT  
FOR MAX8845WETC+  
PLASTIC ENCAPSULATED DEVICES

July 12, 2010

**MAXIM INTEGRATED PRODUCTS**

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## Conclusion

The MAX8845WETC+ successfully meets the quality and reliability standards required of all Maxim products. In addition, Maxim's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim's quality and reliability standards.

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### I. Device Description

#### A. General

The MAX8845Z/MAX8845Y/MAX8845X/MAX8845W are intelligent, stand-alone constant-current, constant-voltage (CCCV), thermally regulated linear chargers designed for charging a single-cell lithium-ion (Li+) battery. The MAX8845Z/MAX8845Y/MAX8845X/MAX8845W integrate a current-sense circuit, MOSFET pass element, thermal-regulation circuitry, and eliminate the external reverse-blocking Schottky diode to create the simplest and smallest charging solutions for handheld equipment.

The ICs control the charging sequence from the pre-qualification state through constant current fast-charge, top-off charge, and full-charge indication. Proprietary thermal-regulation circuitry limits the die temperature during fast-charging or when the ICs are exposed to high ambient temperatures, allowing maximum charging current without damaging the ICs.

The MAX8845Z/MAX8845Y/MAX8845X/MAX8845W achieve high flexibility by providing adjustable fast-charge currents (SETI) and an adjustable top-off current threshold (MIN) through external resistors. The MAX8845Z/MAX8845Y/MAX8845X/MAX8845W feature a booting assistant circuit that distinguishes input sources and battery connection and provides an enable signal (ABO-MAX8845Z and active-low ABO-MAX8845Y/MAX8845X/MAX8845W) for system booting.

The MAX8845Z/MAX8845Y/MAX8845X/MAX8845W also integrate an overvoltage-protected output (SAFEOUT) for low voltage-rated USB or charger inputs in system, and a battery-pack detection circuit (DETBAT) that disables the charger when the battery pack is absent. Other features include an active-low control input (active-low EN), an active-low input power source detection output (active-low POK), and a fully charged top-off threshold detection output (active-low CHG).

The MAX8845Z/MAX8845Y/MAX8845X/MAX8845W accept an input supply range from 4.25V (4.4V for MAX8845W only) to 28V, but disable charging if the supply voltage exceeds +7.5V (+8.0V for MAX8845X only) to protect against unqualified or faulty AC adapters. The ICs operate over the extended temperature range (-40°C to +85°C) and are available in a compact 12-pin, thermally enhanced thin QFN, 3mm x 3mm package (0.8mm max height).

## II. Manufacturing Information

A. Description/Function:	28V Linear Li+ Battery Chargers with Battery Detection and Overvoltage-Protected Output
B. Process:	S45
C. Number of Device Transistors:	4867
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	Thailand, Malaysia or China
F. Date of Initial Production:	October 28, 2009

## III. Packaging Information

A. Package Type:	12-pin TQFN 3x3
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-3356
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Ja:	76°C/W
K. Single Layer Theta Jc:	10.8°C/W
L. Multi Layer Theta Ja:	68°C/W
M. Multi Layer Theta Jc:	11°C/W

## IV. Die Information

A. Dimensions:	54 X 55 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 0.6 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO <sub>2</sub>
I. Die Separation Method:	Wafer Saw

## V. Quality Assurance Information

- A. Quality Assurance Contacts: Richard Aburano (Manager, Reliability Operations)  
Bryan Preeshl (Managing Director of QA)
- B. Outgoing Inspection Level: 0.1% for all electrical parameters guaranteed by the Datasheet.  
0.1% For all Visual Defects.
- C. Observed Outgoing Defect Rate: < 50 ppm
- D. Sampling Plan: Mil-Std-105D

## VI. Reliability Evaluation

### A. Accelerated Life Test

The results of the 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 95 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

(where 4340 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$$\lambda = 11.6 \times 10^{-9}$$

$\lambda = 11.6$  F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maxim-ic.com/qa/reliability/monitor>. Cumulative monitor data for the S45 Process results in a FIT Rate of 0.49 @ 25C and 8.49 @ 55C (0.8 eV, 60% UCL)

### B. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

### C. E.S.D. and Latch-Up Testing (lot TRHWAA006F, D/C 0931)

The PR35-3 die type has been found to have all pins able to withstand a transient pulse of

ESD-HBM:	+/- 2000V per JEDEC JESD22-A114
ESD-MM:	+/- 150V per JEDEC JESD22-A115

Latch-Up testing has shown that this device withstands a current of +/- 100mA and overvoltage per JEDEC JESD78.

**Table 1**  
Reliability Evaluation Test Results

**MAX8845WETC+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
<b>Static Life Test</b> (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	95	0
<b>Moisture Testing</b> (Note 2)				
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	DC Parameters & functionality	77	0
<b>Mechanical Stress</b> (Note 2)				
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	77	0

Note 1: Life Test Data may represent plastic DIP qualification lots.

Note 2: Generic Package/Process data